DOCUMENT RESUME

ED 387 058 HE 028 640

AUTHOR Neuschatz, Michael; Mulvey, Patrick J.
TITLE 1994 Initial Employment Follow-Up of 1993 Physics Degree Recipients.
INSTITUTION American Inst. of Physics, College Park, MD. Education and Employment Statistics Div.
REPORT NO AIP-R-282.17
PUB DATE Jul 95
NOTE 14p.
AVAILABLE FROM American Institute of Physics, One Physics Ellipse, College Park, MD 20740-3843.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Astronomy; *Bachelors Degrees; Career Planning; Demography; *Doctoral Degrees; *Employment Opportunities; Foreign Students; Graduate Study; Higher Education; Masters Degrees; National Surveys; Outcomes of Education; *Physics; Sex Differences; Underemployment; Unemployment

ABSTRACT

This report presents data from a follow-up survey of new physics graduates who entered the job market in 1993, extending findings first presented in the American Institute of Physics' Bachelors Degree Recipient Report in February 1995. It documents the rising unemployment rate among new physics bachelors and Ph.D. recipients since 1989, as well as the increasing number of undergraduates who have opted for graduate studies and Ph.D.s who have taken postdoctoral appointments. Also documented are the rising incidence of underemployment, temporary, and part-time employment among new physics bachelors and Ph.D. recipients actively seeking employment. Demographic data on new masters and Ph.D. graduates in physics and astronomy are also provided. The proportion of women among Ph.D. recipients has been rising slowly for several years, and that the number of non-U.S. citizens receiving physics Ph.D.s continues to increase significantly. (MDM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

AMERICAN INSTITUTE OF PHYSICS

AIP REPORT

One Physics Ellipse
College Park, MD 20740-3843

EDUCATION AND EMPLOYMENT
STATISTICS DIVISION

Tel. (301) 209-3070

by Michael Neuschatz
Patrick J. Mulvey

AIP Pub No. R-282.17

July 1995

ED 387 058

1994 INITIAL EMPLOYMENT FOLLOW-UP OF 1993 PHYSICS DEGREE RECIPIENTS

HE 028 640

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☑ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

AIP

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

BEST COPY AVAILABLE

AMERICAN INSTITUTE OF PHYSICS

One Physics Ellipse
College Park, MD 20740-3843

EDUCATION AND EMPLOYMENT
STATISTICS DIVISION

Tel. (301) 209-3070

by Michael Neuschatz
Patrick J. Mulvey

AIP Pub No. R-282.17

July 1995

1994 INITIAL EMPLOYMENT FOLLOW-UP OF 1993 PHYSICS DEGREE RECIPIENTS

HIGHLIGHTS

- The poor job market for new physics degree recipients at all academic levels continues unabated. Unemployment rates, still relatively modest, are only the tip of the iceberg. (**Fig. 1**)
- Many more graduates end up with part-time or temporary positions, or with jobs that do not utilize their years of physics training. (**Fig. 4**)
- In addition, a rising number are eschewing the job market altogether in favor of graduate study or post-doctoral training. (**Figs. 2 & 3**). Some of the increase may reflect graduates' decisions to postpone their job search until conditions improve.
- For Bachelors recipients directly entering the job market, the order in which jobs are taken suggests that many start out looking for work that is closely related to their training, and only reluctantly broaden their search as unemployment persists. (**Page 5**)
- The proportion of PhDs taking postdocs continued to vary by subfield. Almost half of the graduates in applied physics and optics/lasers found permanent posts, as against less than a quarter in any of the other areas of specialization. (**Fig. 8**)
- Half of all PhDs still aspire to an academic career, although a small and shrinking fraction seem likely to make it. The roots of this persistent mismatch between expectations and reality may relate to outlooks and definitions of success that are deeply embedded in the academic culture in which physics graduate students receive their training. (**Page 10**)
- Unemployment and underutilization also seem to have afflicted physics Masters recipients. As with Bachelor level graduates, over half found employment in private industry. (**Page 11**)
- Most new Astronomy PhDs continue to enter directly into postdoc training. (**Page 12**)

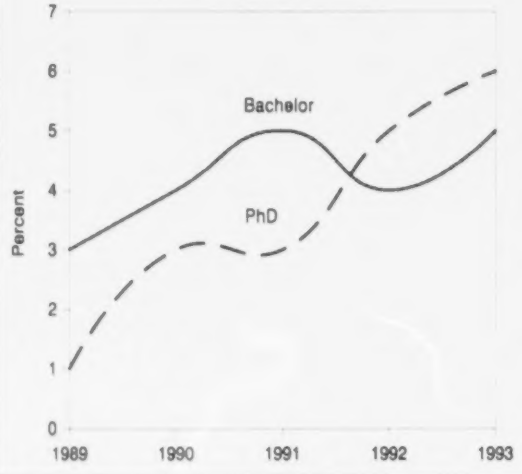
OVERVIEW

Job prospects continued to be sparse for many of those emerging with an undergraduate or graduate physics degree during the 1992-93 academic year, following a trend that has been developing over a number of years. The tight job market showed up in three major ways: in a slowly but steadily rising unemployment rate; in the proportion of graduates who were able to land only part-time or temporary positions; and in the rising proportion of graduates opting to extend their training as graduate students or postdocs rather than look for work, some undoubtedly in hopes of waiting out the poor employment conditions.

Unemployment is still a relative rarity for members of the physics community compared to the rates prevalent in the larger economy, which is populated by many

Member Societies: The American Physical Society • Optical Society of America • Acoustical Society of America • The Society of Rheology • American Association of Physics Teachers
American Crystallographic Association • American Astronomical Society • American Association of Physicists in Medicine • American Vacuum Society • American Geophysical Union

Figure 1. Percent of new physics Bachelors and PhD recipients remaining unemployed in the winter following year of graduation.



job seekers with lower educational credentials than is the norm for physics degree recipients. Still, as **Figure 1** shows, there has been a steady rise in recent years in unemployment levels for new physics degree recipients, as assessed during the winter following the academic year in which they completed their studies. These measurements are taken as part of the American Institute of Physics' annual follow-up of new physics graduates who enter the job market, taken at a point at which most have been out of school for around half a year, and some for almost an entire year. Throughout the report, all discussion of post-degree outcomes focuses on degree recipients who remain in the United States following graduation.

But the situation conveyed in **Figure 1** is only the tip of the iceberg. AIP conducts a broader survey of all physics undergraduates and graduate students around the time when most are completing their degrees, in order to ascertain their post-degree plans for work or continued study. Over the years, close to half of the undergraduates have opted for graduate studies, while many PhDs have taken postdoctoral appointments that extend their training rather than moving directly into a career position. However, in periods of job market tightness, it is not uncommon for these proportions to be swollen by graduates who would have looked for work in normal times but who now choose to pursue additional training in order to improve their marketability, while waiting out the employment doldrums. **As Figures 2 and 3** illustrate, the past few years have registered notable rises in the proportions of Bachelor recipients planning to enter graduate programs and PhDs taking postdocs. It is likely that at least some of this increase is attributable to the poor job market.

Figure 2. Post-graduation plans of physics Bachelors recipients.*

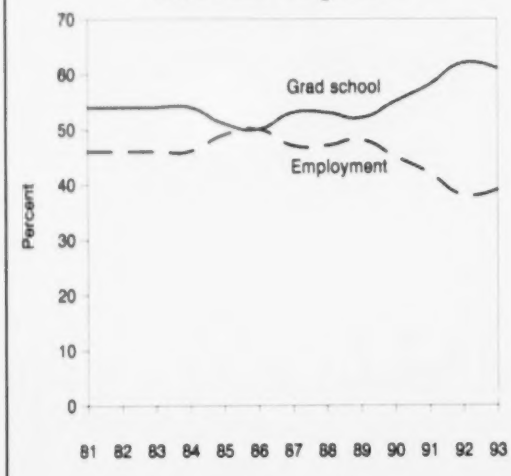
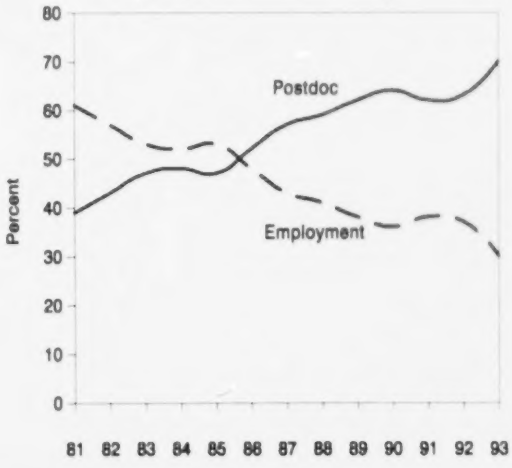


Figure 3. Post-graduation plans of physics PhDs (U.S. citizens only).*



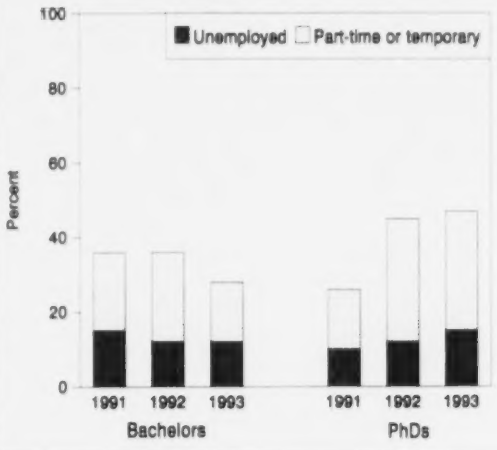
* Excludes those with no immediate plans or who plan to leave the U.S. after graduation.

Thus, the rise in the unemployment rate depicted in **Figure 1** has occurred even though the proportion of new graduates who forsake further training and enter directly into the job market has been falling. Still more disquieting, all is far from well even among the job prospectors who have been successful in finding work. Recent Initial Employment Follow-up Surveys have revealed a large number of job-holders who have had to settle for only part-time or temporary non-postdoctoral positions four or more months after graduation.

Of course, as before, we must qualify this conclusion by noting that a few graduates may prefer part-time or temporary work, even going so far as to impose their own time limit on an otherwise potentially permanent position. Unfortunately, the Winter 1994 Employment Survey did not directly ask temporary or part-time jobholders whether they took their position voluntarily. However, it is likely that the vast bulk of employment-oriented degree recipients would have preferred a potentially permanent full-time job. For example, virtually none of the new PhDs taking temporary jobs indicated that they had turned down an offer of a permanent position. So, when we add these groups to the unemployed in **Figure 1**, we find that more than a quarter of the Bachelor class of 1993 and almost half of the PhDs looking for "career jobs" (not postdocs) have not found full-time potentially permanent employment many months after graduation. And these figures obtain even though we have treated respondents with missing information in the most conservative manner possible.

Figure 4 illustrates these findings graphically, and includes comparable data for the two previous years. Changes in the questionnaire form preclude precise comparisons with earlier years. However, while the paucity of data points and wording changes makes it risky to extrapolate trends, a great deal of anecdotal information from the physics community and data from other sources all suggest that these levels of underutilization following graduation are high by historical standards, and substantially higher than they were five or ten years earlier. Even though precise data on the trajectory of the trend will have to wait for future years' surveys, simply the dimensions of the circumstances faced by current post-degree jobseekers command attention. We now turn to a more detailed look at the situation of these employment-oriented graduates at each level.

Figure 4. Underutilization among employment-oriented physics PhDs (*excluding postdocs*) and Bachelors, in the winter following year of graduation.



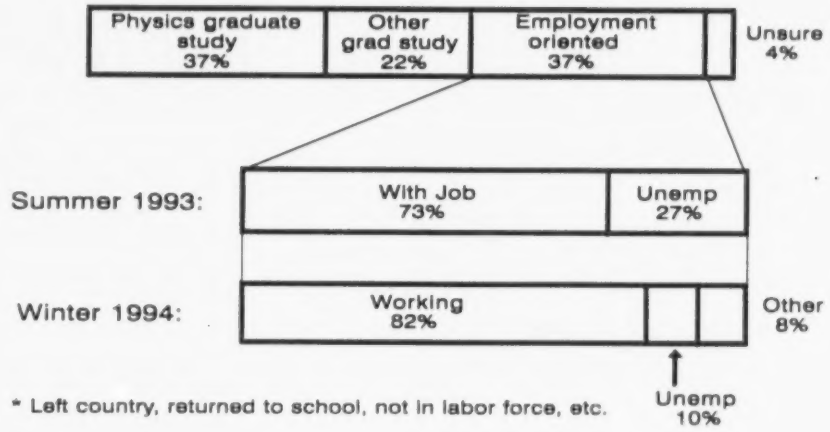
BACHELORS RECIPIENTS

Figure 5, extending findings first presented in AIP's Bachelors Degree Recipient Report in February 1995, lays out schematically the post-baccalaureate plans and short-term employment outcomes for the 4800 physics majors who graduated from US colleges and universities during the 1992-93 academic year. (For a more detailed picture of the 1993 Bachelor class on issues other than employment, see that report, single copies of which are available free from AIP.)

The Initial Employment Follow-up Survey went out early in the winter of 1994 to all 1993 Bachelors Survey respondents who indicated plans to enter the job market following graduation. Of the roughly 800 who fit this definition, some 500 returned the employment follow-up form. **Figure 6** provides detail on some of the difficulties encountered by those looking for work, specifically the time they spent seeking a position and the number of offers they received.

For those who went on to secure a job (including temporary and part-time positions), **Table 1** furnishes information on the type of employment they found. The patterns shown in the table are similar to those found in the past few years, and consistent with a longer-term trend of a shift in private industry from manufacturing to the service sector, paralleling developments in the larger economy. As will be noted later,

Figure 5. Post-degree outcomes for 1993 Bachelors recipients, summer 1993 and winter 1994.



even those who are able to find physics-related employment cannot necessarily count on extensive use of their physics training.

Table 2 compares the broad employment sector of the positions acquired by gender, type of position, use of physics training and starting salary. As was true last year, high school teachers were the only group where a substantial number reported using their physics training, while two-thirds of those going into private service sector companies reported using little or none of their physics training.

Some interesting leads into the nature of the job search emerged from the data. For one thing, graduates did not appear to be choosy (or did not have the chance

Figure 6. Job search experiences, 1993 physics Bachelors.

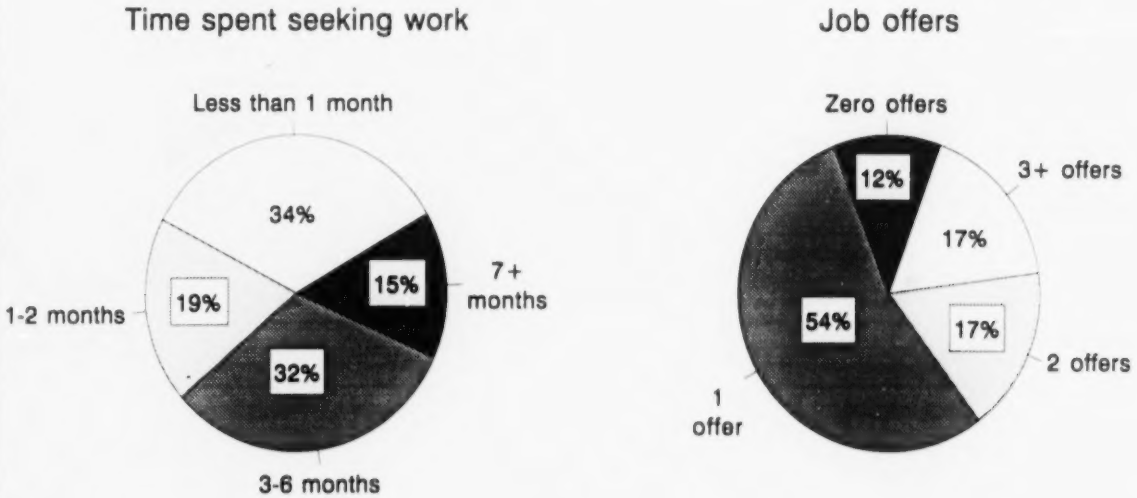


Table 1. Employment sector of first job and relation to physics training, 1993 physics Bachelors.

Employment Sector		Focus of Employment	
Industry - Manufacturing	27 %	Physics-related	50 %
Industry - Services	27	Other sciences	18
Government / National Labs	16	Non-science professional	21
High school	12	non-professional	11
College / University	8		
Non-Profit	4		
Other	6		

to be so), generally taking the first offer that came along. Thus, only around one-third of those with jobs reported having had more than the one offer. Moreover, there seemed to be a modest tendency for the jobs with the greatest connection to the field of physics to go first. As shown in **Table 3,** the proportion finding positions within the first 3 months after graduation was highest for those who landed jobs in physics, closely followed by those with jobs in other sciences and other professional jobs. Those accepting non-professional jobs took longer. Besides their distance from physics, another possible reason why these non-professional jobs seemed to be taken only as a last resort was that the median starting salary lagged far behind the other categories. Many were described by respondents as temporary stopgaps while the search for a more suitable position continued.

Thus, the picture that emerges is that many graduates seem to start out hoping to find work appropriate to their physics training. As time goes on, those who have not been successful in their quest reluctantly broaden their search strategy to encompass other fields, progressively farther from physics. Ultimately, 57% of those finding work report accepting a position where they would use little or none of their physics background.

Table 2. Employment sector by gender and job characteristics, 1993 physics Bachelors.

		Academic %	Government %	Industry %
Gender	Female	26	19	18
	Male	74	81	82
Focus of Employment	Physics-related	78	68	38
	Other Science	13	11	22
	Non-science prof	7	16	26
	Non-professional	2	5	14
Use of physics training	Extensive/Moderate	65	55	34
	Little/None	35	45	66
Median starting salary		$22,000	$25,000	$28,000

Table 3. Focus of employment by time spent seeking job and starting salary, 1993 physics Bachelors.

	3 Months or less %	4 -6 Months %	7+ Months %	Median Salary
Physics-related	63	29	8	$26,000
Other science	61	32	7	26,000
Non-science professional	55	36	9	26,000
Non-professional	41	35	24	15,000

The degree to which physics is used also hinges on the employment sector in which the job is located, as was shown in **Table 2**. More than three-fourths of those finding positions in academia and two-thirds of those entering government or non-profit organizations describe their jobs as physics related, compared to only 38% of those taking jobs in private industry.

The speed with which physics-related jobs are snapped up carries over to the order in which jobs in different employment sectors are taken. Thus, jobs in academe, government and non-profit organization jobs are spoken for first, with only 30% of those taking these jobs looking for more than 2 months. In contrast, half of those ending up with industrial jobs took three or more months to find them. Starting salaries range in reverse order, with medians of $28,000 in industry, $25,000 in the government and non-profit sector, and $22,000 in academia.

Two points which are often seen as influencing success or failure in the initial job search after graduation involve the methods used to secure employment and the willingness to relocate. As to the latter, some 70% of our respondents said they were open to relocating to secure a job, but that flexibility did not seem to result in lower unemployment rates, better jobs, or even quicker placement. Turning to the job search methods which employed respondents reported using to find their jobs, we found only a slight relationship between the approach used and the type of job secured. **Table 4** depicts the popularity of the various approaches employed, as well as the outcome in terms of the use of physics and the salary level of the job obtained.

NEW PhDs

The employment situation of recently-graduated PhDs has probably received the most attention in the last two or three years, both within the physics community and from the general media across the country. As we noted earlier, the main problem is not (or at least not yet) one of long-term unemployment. While the percentage of degree recipients without jobs or job commitments at the point of graduation has climbed into double digits in recent years, by the winter following graduation the number still without jobs has consistently fallen to half that level or less. Still, the number of openly unemployed doctorate recipients has been creeping up from year to year, to a level that is not negligible by historical standards and represents substantial anguish for those affected.

Table 4. Use of physics training and starting salary by job search method, 1993 physics Bachelors.

Method used	Overall Distribution %	Percent using physics training extensively or moderately in new job	Median Salary
Answered ad / Sent resume	34	43	$23,000
Personal contacts	34	43	24,000
Job fair / Agency / Univ. placement	20	38	30,000
Prior employer	10	35	30,000

Table 5 provides information on all physics PhDs, gathered from the graduates themselves at the end of the 1992-93 academic year in AIP's annual Graduate Student Survey. Where possible, the findings have been further supplemented by data collected from the physics departments in the Fall of 1993 about their doctoral recipients for the previous year.

As discussed in the **Enrollment and Degrees Report** for 1994 (available from AIP), the proportion of women among PhD recipients has been rising slowly but steadily for years, roughly doubling over the past decade. This rate of increase is similar to that in a number of other science disciplines where women have historically been underrepresented. The proportion of foreign students (especially those holding temporary visas) has also risen conspicuously in the last dozen years or so, with students from East Asia (primarily the Peoples Republic of China) predominating. Twenty years ago, the proportion of foreign students was not only much smaller but also somewhat different in origin, with a higher proportion coming from Western Europe and other advanced industrial nations.

In contrast to the rapidly changing proportion of non-citizens, **Table 5** also includes a number of characteristics of new PhDs that have been relatively stable over the past several years. For one thing, the representation from US minorities other than Asian-Americans remains vanishingly small. Second, the proportion of students entering physics graduate study after earning a Bachelors degree in another discipline remains quite low. Finally, the time taken to complete the PhD has been essentially constant since the late 1980's, after having risen during the previous decade.

Figure 7 shows the employment outlook for the 557 new PhDs completing AIP's Graduate Student Survey at the end of the academic year in which they got their degree. Three hundred and thirty-four of them responded again to the Initial Employment Follow-up Survey and described their employment situations some six months later.

As with the Bachelors recipients, we found no evidence that those remaining unemployed six months after earning their doctorates had precipitated their plight by being choosy. Only two of the unemployed who responded reported receiving any kind of job offer, and in both cases it was for a temporary job only. A similar lack of choosiness was apparent for those who had landed a permanent position, again like their counterparts among the Bachelors recipients - virtually everyone who got a permanent offer took it, and more than two-thirds got only one such offer.

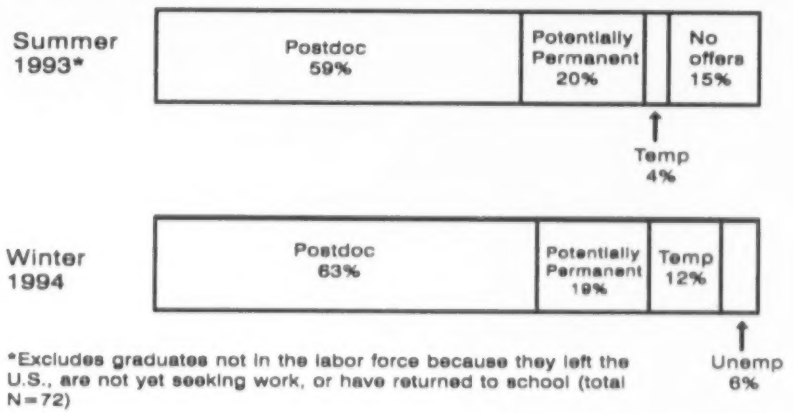
Table 5. Background characteristics, 1993 physics PhDs.

Population		1369
Gender*		
Female		12%
Male		88
Citizenship by Race / Region*		
US		53%
White	90%	
Black	1	
Hispanic	2	
Asian	6	
Other	1	
Non-US		47%
East Asian	60%	
South Asian	9	
Hispanic	4	
Arab	3	
Other	24	
Bachelor Major		
Physics		94%
Engineering		4
Other		2
Full-time (or FTE) registered years to degree		
Less than 5 Years		5%
5 Years		21
6 Years		30
7 Years		24
8 Years		11
9+ Years		9

* From the **Enrollment and Degrees Report**

The general impression that permanent positions were favored over postdocs by those who had a choice was reinforced by the finding that while fewer than one in twenty postdocs reported turning down a permanent job, one fourth of the permanent job takers had turned

Figure 7. Post-degree outcomes for 1993 physics PhDs , summer 1993 and winter 1994.


Summer 1993*
Postdoc 59%
Potentially Permanent 20%
No offers 15%
Temp 4%
Winter 1994
Postdoc 63%
Potentially Permanent 19%
Temp 12%
Unemp 6%
*Excludes graduates not in the labor force because they left the U.S., are not yet seeking work, or have returned to school (total N=72)

down postdoc offers. On the other hand, many of those with only postdoc offers at least enjoyed some degree of choice, with about half reporting more than one postdoc offer.

Figure 8 shows, for the largest subfields within physics, the proportion of responding PhDs who held permanent jobs versus the proportion taking postdocs at the time of the survey. (The percentages working in temporary or part-time positions or remaining unemployed are omitted because of the small and therefore potentially unreliable numbers involved.) As was also true for 1991-92 graduates, those specializing in elementary particles were the most likely to take postdocs. Specialists in fields with strong industrial as well as academic potential, such as optics and applied physics, were most likely to secure potentially permanent jobs. (In fact, although fewer than one PhD in 12 specialized in optics/lasers, this subfield accounted for almost one-fourth of the potentially permanent positions outside of academe.)

There was some evidence that a graduate's adaptability to the demands of the marketplace may affect the process of landing a job. Thus, while 87% of the graduates taking postdocs stayed in their degree subfield, close to a third of those getting academic jobs and almost half of those getting non-academic jobs switched to a different area of specialization. However, we found no evidence of a stampede out of the subfields where jobs were scarce. For example, the subfields with the highest proportion of emigrants, mathematical physics and electron, atomic and molecular physics, were in the middle of the pack in terms of the proportion of graduates finding potentially permanent posts.

Table 6 provides additional comparisons of post-degree outcomes by citizenship, sector of employment, and general research emphasis at time of graduation.

Figure 8. Subfield of study by post-degree outcome*, 1993 physics PhDs.

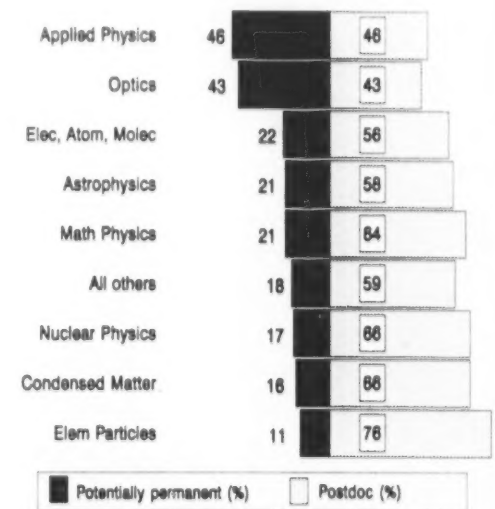

Applied Physics 46 46
Optics 43 43
Elec, Atom, Molec 22 56
Astrophysics 21 58
Math Physics 21 64
All others 18 59
Nuclear Physics 17 66
Condensed Matter 16 66
Elem Particles 11 76
Potentially permanent (%)
Postdoc (%)
*Those accepting temporary positions or remaining unemployed excluded

Table 6. Post-degree outcome by selected characteristics, 1993 physics PhDs.								
	Research Approach			Citizenship		Employment sector		
	Experiment %	Theory %	Com-puter %	US %	Foreign %	Academic %	Industry %	Govt/Labs/ Nonprofit %
Postdoc	66	20	14	63	37	72	4	24
Potentially permanent	69	17	14	84	16	28	48	24
Temporary	47	20	33	65	35	77	17	6
Unemployed	68	23	9	59	41	-	-	-

Not surprisingly, the type of work one ends up doing is strongly related to the employment sector one enters. Those employed in high schools or four year colleges devote themselves to teaching exclusively. At universities, teaching (51%) and basic research (46%) share the spotlight in roughly equal proportions. In government and non-profit organizations (including the national labs), the main stress is still on basic research (63%) and only secondarily on applied research (32%). In industry, in contrast, applied research (68%) and activities completely outside of physics (17%) dominate, with only 15% focusing on basic research.

Salaries for new PhD physicists appear stable, rising slightly to keep pace with inflation and following the patterns found in recent years. As before, salaries were best in industry, followed by the government/national lab/non-profit sector, and finally by academia. (**See Figure 9.**) The gap between potentially permanent positions and postdocs generally ranged from 10 to 30%, depending on sector. (Salaries of temporary jobs varied greatly, with too few respondents to report reliable averages.)

There are very little reliable data from any discipline about the ultimate career trajectory of new PhDs who take postdocs or temporary jobs right after graduation. **Figure 10** depicts the scheduled duration of the initial position obtained by these students. However, a good deal of anecdotal evidence has surfaced about the difficulty many experience making the transition to a stable career path, with suggestions that some repeat two or even three tours of postdocs before finding a permanent position in physics or despairing and accepting work in another field. Other tales recount instances where graduates become locked into successive rounds of contract teaching jobs or other temporary positions, and find it increasingly difficult to make the transition to permanent work. Unfortunately, there is currently no accurate measure of how common such experiences are, since most studies (including AIP's Initial Employment Follow-up) track graduates for only a few months following degree.

One of the most perplexing questions is why so many graduates opt for and then hang on for so long in postdocs or temporary positions. A big part of the answer may have to do with the continued overwhelming dominance of academic employment in the career plans of new PhD physicists. In the past, postdocs were often an important step on the road to a tenure-track appointment at a prestigious research university. This seems even more the case in today's tight job market. The number of current graduates getting university positions right out of graduate school is minuscule, and only one in five of these positions are tenure-track.

Figure 9. Median salary by post-degree outcome and employer type, 1993 physics PhDs.

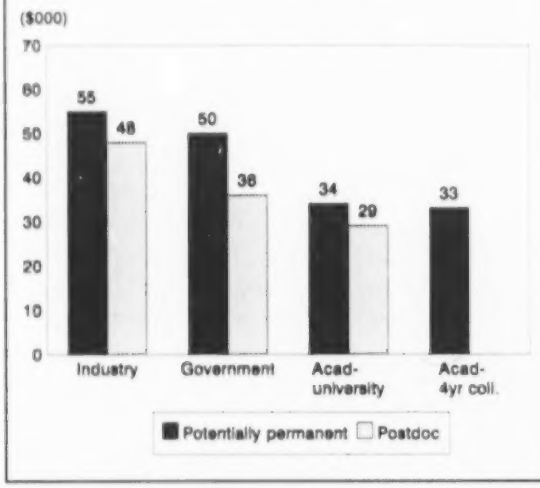
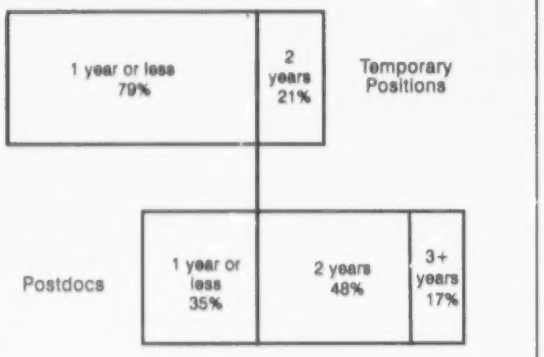


Figure 10. Duration of initial postdoc or temporary position, 1993 physics PhDs.



To get a fuller picture of where new graduates ultimately wanted to go, the AIP survey introduced a question specifically about career goals. While one-quarter of those responding indicated flexibility and another fourth aimed at non-academic positions, fully one-half of the PhD recipients aspired to a position in academe. Among those taking postdocs, the proportion is even higher. Unfortunately, a very rough estimate from AIP's Academic Workforce Survey (available from the AIP Statistics Division) suggests that the fraction of new PhDs staying on in this country who will finally get permanent academic positions is closer to one-fifth than one-half. Clearly, all the ingredients for continued frustration and disappointment are at hand.

An interesting piece of anecdotal evidence about the stubbornness of the problem comes from a report on a graduate seminar organized by one large physics department to acquaint students with the range of career possibilities awaiting them outside of academe. Despite the fact that the sessions were well-attended and students seemed quite aware of the dismal academic job market and the options available in fields like finance or medical physics, the organizers reported that, come graduation time, most still sought a postdoc in their dissertation subfield.

One unpleasant "solution" that may be in the offing is that the market for postdocs itself may well be reaching the saturation point, which will push more of the new graduates either into even more transient temporary positions or cause more of them to broaden their horizons beyond physics altogether. Unfortunately, unless this is accompanied by a change in career goals, the current level of disillusionment will not only persist but is likely to worsen over the short term.

STUDENTS STOPPING AT THE MASTERS LEVELS

Three very different subgroups have traditionally been encompassed within the broad category of Masters degree recipients. One subgroup consists of students who receive the Masters on the way to earning their PhD. Since their real objective is the doctorate, and they do not plan to enter the job market until that point, this group is not incorporated in the present study, but rather will be included once they have gotten their PhD.

The other two subgroups are composed of students who end their physics graduate studies after having earned their Masters. For one of these groups, the objective was always the Masters as a professional degree, including those graduating from Masters-only physics departments and those in specifically Masters-level programs at doctoral departments. Those belonging to the final group initially entered doctoral departments to pursue the PhD but for various reasons terminated their studies at the Masters level. (Unfortunately, it is hard to distinguish these two groups among Masters recipients from doctoral departments without being privy to students' original intentions.) These last two groups form the subject of the present section.

Table 7 presents background information on those 1993 Masters recipients who did not go on to further study. The data on gender, racial/ethnic background for US citizens, and region of origin for noncitizens were provided by departments queried in AIP's Enrollments and Degrees Survey. Data on age and baccalaureate major come from responses to AIP's Graduate Student Survey.

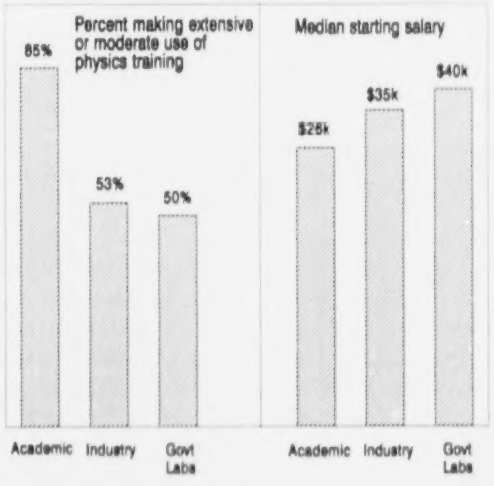
Table 7. Background characteristics, 1993 physics graduates stopping at the Masters level.

Population		877
Gender		
Female		15%
Male		85
Citizenship by Race / Region		
US		66%
White	92%	
Black	4	
Hispanic	1	
Asian	3	
Non-US		34%
East Asian	59%	
South Asian	15	
Hispanic	2	
Arab	4	
Other	20	
Bachelor Major		
Physics		70%
Engineering		21
Other		9
Age		
Less than 25 years old		9%
25 - 28		38
29 - 32		32
33 - 36		7
37 +		14

As with the Bachelors recipients and PhDs, employment information on students ending their physics study at the Masters level comes from responses to the Employment Follow-up Survey in the winter following the year they graduated. Low initial numbers, coupled with low response rates, limit the detail which can be brought out. Even bearing this in mind, one significant finding is that more than a quarter of the Employment Follow-up respondents remained unemployed or in temporary or part-time positions six months after graduation. This is even more striking when we take into account that almost one-fifth of the Masters recipients reported at graduation time that they planned to continue with their current employer, and a similar proportion indicated plans to go into the military. Among those Masters respondents who had found jobs, most of the posts taken are in the industrial sector, and involve R&D, computer programming or data analysis. Almost a quarter said their employer was a defense contractor.

Figure 11 portrays the use of physics and starting salaries by employer type. Not unexpectedly, in almost every instance the overall midpoints for both variables fall between the levels reported for Bachelors and PhD recipients. The distributions also match the patterns for the other degree levels, with academic jobs making the most use of physics training but paying the lowest salaries. Because it focuses on starting salaries, **Figure 11** excludes the earnings of Masters recipients who reported that they were returning to or continuing with a previous employer, including almost one-fourth of those getting civilian jobs and virtually all of those working for the military.

Figure 11. Use of physics training and median salaries, 1993 physics graduates stopping at the Masters level.



ASTRONOMY

In the 1992-93 academic year, there were 190 Bachelors degrees granted in astronomy, 56 Masters to students not continuing on to an astronomy PhD, and 119 PhDs. **Table 8** provides some background data for graduate degree recipients from the Graduate Student Survey, with data on citizenship taken from the departmental Enrollment and Degrees Survey. (Data on astronomy Bachelors degree recipients can be found in the 1992-93 Bachelor Degree Recipient Report, available from the AIP Statistics Division.)

As with the preceding section on Physics Masters Degree recipients, astronomy is another area where the low number of graduates precludes all but the most basic analysis on the Employment Follow-up. Similarly to previous years, most of the astronomy Bachelors pursue graduate study and around three-fourths of the PhDs take a postdoc. The high proportion opting for postdocs may be related to two factors. One is the historical absence of industrial jobs for astronomy graduates, and the corresponding concentration of jobs in academe and certain national labs and government agencies, both areas where postdocs are a more common part of the normal career path. The other more recent factor is the high proportion (currently around half) of those going directly into the job market who remain either unemployed or in temporary positions months after graduation.

Table 8. Background characteristics 1993 Astronomy Masters and PhDs.

	Graduates stopping at the masters level	Graduates completing PhD
Population	56	119
Gender		
Female	23%	20%
Male	77	80
Citizen		
US	96%	76%
Non-US	4	24
Bachelor Major		
Astronomy	*	43%
Physics	*	43
Other	*	14
Full-time (or FTE) registered years to degree		
Less than 5 Years	*	9%
5 Years	*	23
6 Years	*	43
7+ Years	*	25

* Insufficient data